

**Appendix 3 – Lake Mead, Lake Mohave, and Lake
Havasu Evaporation from Reclamation’s
Hydrologic Database (HDB)**

Introduction

This Appendix to the Lower Colorado River Mainstream Evaporation and Riparian Evapotranspiration Losses Report provides monthly and annual evaporation losses from the HDB dataset. Table A3-1 provides Lake Mead data between 2001 and 2021, including the annual high and low water surface elevations, the average surface area, and the monthly and annual evaporative loss estimates. Figure A3-1 graphically shows the high and low elevations and the total estimated evaporation for Lake Mead that are provided in Table A3-1.

Tables A3-2 and A3-3 provide the annual high and low elevation water surface elevations, the average surface area, and the monthly and annual evaporative loss estimates for Lake Mohave and Lake Havasu, respectively, between 2017 and 2021.

The data provided in Tables A3-1 and A3-2 used updated Lake Mead and Lake Mohave coefficients based on a 2021 USGS evaporation study. The USGS study did not include an update for the Lake Havasu coefficients used in Table A3-3. The coefficients used are listed in Appendix 5, Table A5-2.

An online data query tool is available to access data from Reclamation’s HDB at <https://www.usbr.gov/lc/region/g4000/riverops/HdbWebQuery.html>. To query data found in this report, users would select the “Lower Colorado Regional Office” as the desired HDB. A list of site-database ID (SDI) numbers relevant to this report is provided in Table A3-1 below. The user can then specify a data frequency and date range, selected “Observed” as the desired data type, then specify the desired output and click “Build Request”. A web link to the specified data query will be available below the “Build Request” button, and the user can either click the link or copy and paste it into a new web browser to view the data.

The new USGS coefficients were implemented in the official HDB record starting in October 2021. For this report, the new USGS evaporation coefficients were applied to the entire Lake Mead 2001 – 2021 dataset and the Lake Mohave 2017 – 2021 dataset since they provide a more accurate temporal distribution and evaporation magnitude at Lake Mead and Lake Mohave. Therefore, data from online HDB query tool prior to October 2021 will not match the data provided in this report.

Table A3-1. SDI numbers for Lake Mead, Lake Mohave, and Lake Havasu data to use in the HDB online data query.

Data type	Lake Mead SDIs	Lake Mohave SDIs	Lake Havasu SDIs
Elevation	1930	2100	2101
Surface Area	23096	2168	2148
Evaporation	1776	1777	1778

Table A3-2. Lake Mead data (2001 – 2021) from HDB with the updated 2021 USGS coefficients applied to the historic dataset.

Lake Mead Evaporation (AF)																
Year	Low Elev (ft)	High Elev (ft)	Average Surface Area ¹ (acres)	Total Evap (AF)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001	1178	1197	136,049	842,089	44,307	41,493	45,531	60,408	74,634	90,954	85,490	92,771	89,482	83,806	73,193	60,022
2002	1152	1178	120,874	744,923	40,524	37,825	41,112	53,944	65,944	79,873	75,217	81,590	78,747	73,772	64,135	52,238
2003	1139	1155	109,477	678,240	35,207	33,168	36,573	48,254	59,179	72,455	68,710	75,168	73,056	68,376	59,462	48,631
2004	1126	1141	102,485	635,472	32,828	30,770	33,843	45,005	55,473	67,668	64,092	70,061	68,078	64,178	56,670	46,806
2005	1130	1148	106,124	661,620	32,028	30,835	34,883	47,021	58,162	71,405	67,766	74,007	71,798	67,217	58,443	48,057
2006	1125	1141	102,458	635,222	32,665	30,794	33,981	45,166	55,752	68,067	64,370	70,145	67,986	63,931	56,092	46,273
2007	1110	1130	96,616	598,044	31,378	29,431	32,216	42,490	52,239	63,847	60,448	65,888	63,936	60,064	52,573	43,533
2008	1104	1118	93,325	577,847	29,670	27,879	30,709	40,721	50,143	61,353	58,249	63,731	62,095	58,839	51,675	42,782
2009	1093	1113	89,460	553,559	29,149	27,293	29,793	39,108	48,045	58,928	56,017	61,101	59,299	55,763	48,778	40,286
2010	1082	1103	86,409	537,015	27,484	26,062	28,792	38,290	47,511	58,021	54,678	59,538	57,496	53,651	46,778	38,713
2011	1086	1133	91,971	577,495	26,571	25,292	28,142	37,815	47,624	59,848	58,287	65,404	64,841	61,908	55,223	46,538
2012	1115	1135	98,216	608,277	31,926	29,882	32,645	42,999	52,872	64,601	61,317	67,167	65,144	61,304	53,869	44,553
2013	1104	1123	93,649	580,228	30,300	28,440	31,171	41,157	50,561	61,695	58,584	64,100	62,421	58,474	51,095	42,231
2014	1080	1109	86,447	533,534	28,630	26,860	29,167	38,130	46,676	56,599	53,339	58,132	56,620	53,433	47,001	38,949
2015	1075	1089	83,054	515,859	26,534	24,844	27,226	35,907	44,272	54,478	52,177	57,574	55,887	52,718	46,175	38,067
2016	1072	1084	81,895	508,910	25,911	24,408	26,763	35,382	43,797	53,828	51,295	56,563	55,166	52,101	45,875	37,822
2017	1079	1090	83,826	521,725	25,982	24,750	27,420	36,521	45,311	55,652	52,869	58,042	56,680	53,477	46,662	38,360
2018	1076	1088	83,340	518,023	26,161	24,750	27,338	36,494	45,152	55,149	52,356	57,569	56,035	52,784	46,171	38,063
2019	1081	1090	84,587	523,928	26,041	24,606	27,455	36,920	46,089	56,665	53,823	58,695	57,035	53,655	43,816	39,129
2020	1081	1099	85,646	532,147	26,926	25,444	28,233	38,016	47,142	57,454	54,194	58,893	57,152	53,579	46,634	38,481
2021	1065	1087	80,771	500,743	26,161	24,668	27,104	35,928	44,076	53,426	50,379	55,059	53,455	50,500	43,951	36,036
Average	1103	1122	95,080	589,757	30,304	28,547	31,433	41,699	51,460	62,951	59,698	65,295	63,448	59,692	52,108	43,122
Average 2017-2021	1077	1091	83,634	519,313	26,254	24,844	27,510	36,776	45,554	55,669	52,724	57,651	56,071	52,799	45,447	38,014

¹ This is the annual average, calculated by utilizing the average daily surface area to obtain a monthly average surface area, which was subsequently averaged to provide the annual average surface area. A dynamic surface area is used for evaporation calculations in Reclamation's HDB, which is based on Lake Mead's elevation and the area and capacity tables: https://www.usbr.gov/lc/region/g4000/LM_AreaCapacityTables2009.pdf.

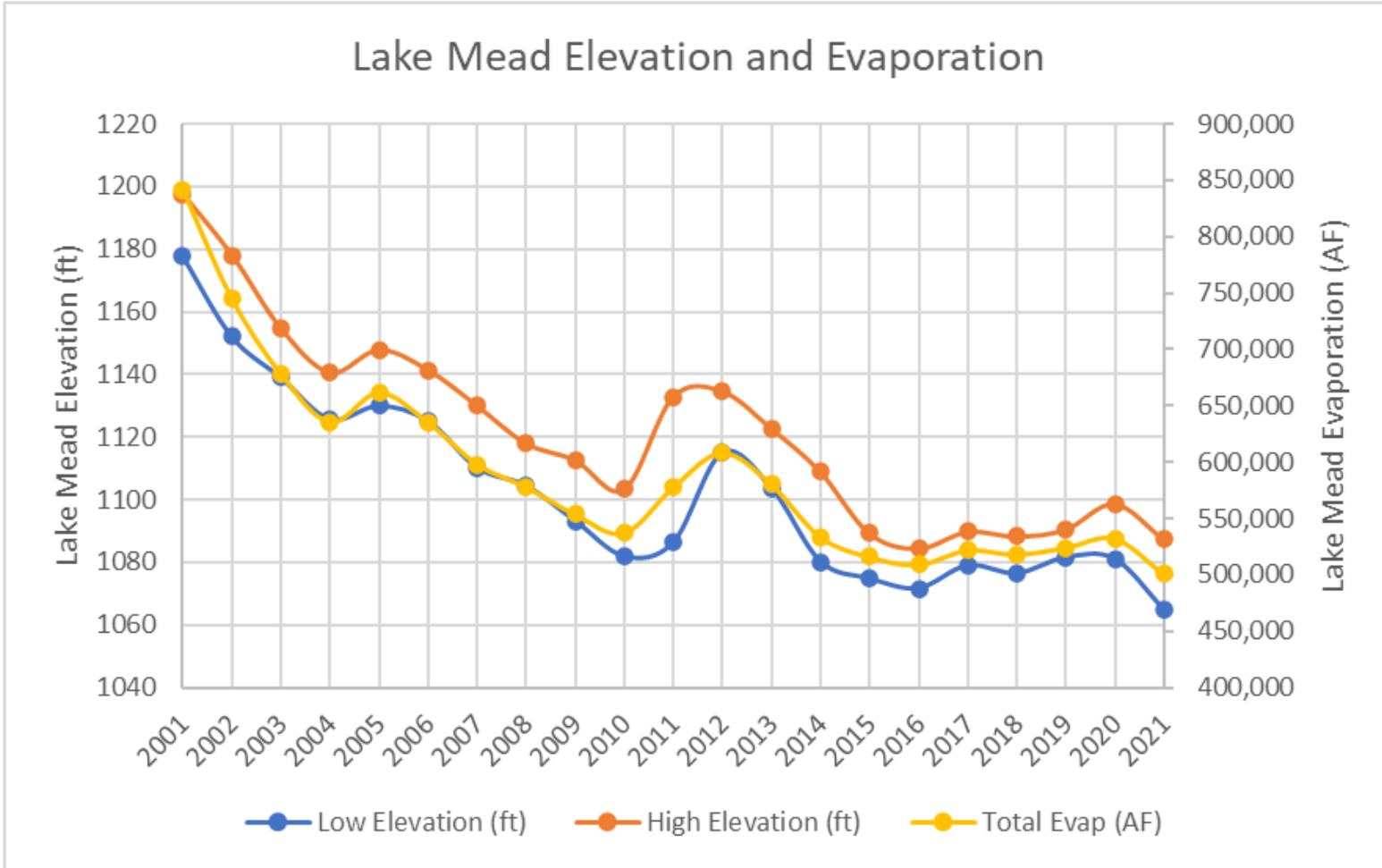


Figure A3-1. Lake Mead Elevation and Evaporation from 2001 to 2021

Table A3-3. Lake Mohave data (2017 – 2021) from HDB with the updated 2021 USGS coefficients applied to the historic dataset.

Lake Mohave Evaporation (AF)																
Year	Low Elev (ft)	High Elev (ft)	Average Surface Area ² (acres)	Total Evap (AF)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	636	645	27,115	152,350	9,045	7,642	10,119	12,628	14,238	13,944	12,281	15,684	16,553	14,378	12,932	12,905
2018	635	645	27,007	151,592	8,963	7,592	10,100	12,520	14,166	13,972	12,362	15,493	16,324	14,323	12,912	12,865
2019	637	644	27,095	152,094	8,857	7,655	10,118	12,553	14,180	14,006	12,254	15,563	16,281	14,472	13,031	13,123
2020	634	646	26,955	151,489	8,914	7,601	10,141	12,644	14,191	13,956	12,300	15,583	16,232	14,228	12,898	12,800
2021	634	644	26,939	151,085	8,801	7,602	10,032	12,484	14,150	13,890	12,337	15,640	16,491	14,226	12,725	12,707
Average	635	645	27,022	151,722	8,916	7,619	10,102	12,566	14,185	13,954	12,307	15,593	16,376	14,325	12,900	12,880

Table A3-4. Lake Havasu data (2017 – 2021) from HDB.

Lake Havasu Evaporation (AF)																
Year	Low Elev (ft)	High Elev (ft)	Average Surface Area ³ (acres)	Total Evap (AF)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	446	449	18,890	140,019	6,446	7,709	9,113	11,179	13,386	15,409	17,122	16,942	15,320	12,245	8,614	6,535
2018	446	449	18,865	139,506	6,270	7,559	9,028	11,003	13,191	15,433	17,179	16,710	15,292	12,410	8,736	6,695
2019	446	450	18,941	139,880	6,369	7,673	9,036	11,080	13,309	15,424	16,987	16,796	15,320	12,368	8,717	6,801
2020	446	449	18,711	139,047	6,345	7,593	9,104	11,058	13,105	15,363	16,974	16,806	15,206	12,276	8,662	6,555
2021	446	449	18,915	139,677	6,322	7,593	8,978	11,019	13,364	15,474	17,098	16,884	15,325	12,396	8,633	6,592
Average	446	449	18,864	139,626	6,350	7,625	9,052	11,068	13,271	15,421	17,072	16,828	15,293	12,339	8,672	6,636

² This is the annual average, calculated by utilizing the average daily surface area to obtain a monthly average surface area, which was subsequently averaged to provide the annual average surface area. A dynamic surface area is used for evaporation calculations in Reclamation's HDB, which is based on each reservoir's elevation and the area and capacity tables.

³ This is the annual average, calculated by utilizing the average daily surface area to obtain a monthly average surface area, which was subsequently averaged to provide the annual average surface area. A dynamic surface area is used for evaporation calculations in Reclamation's HDB, which is based on each reservoir's elevation and the area and capacity tables.